DEVELOPING A BANGLA CURRENCY RECOGNIZER FOR VISUALLY IMPAIRED PEOPLE: A DEEP-LEARNING BASED APPROACH

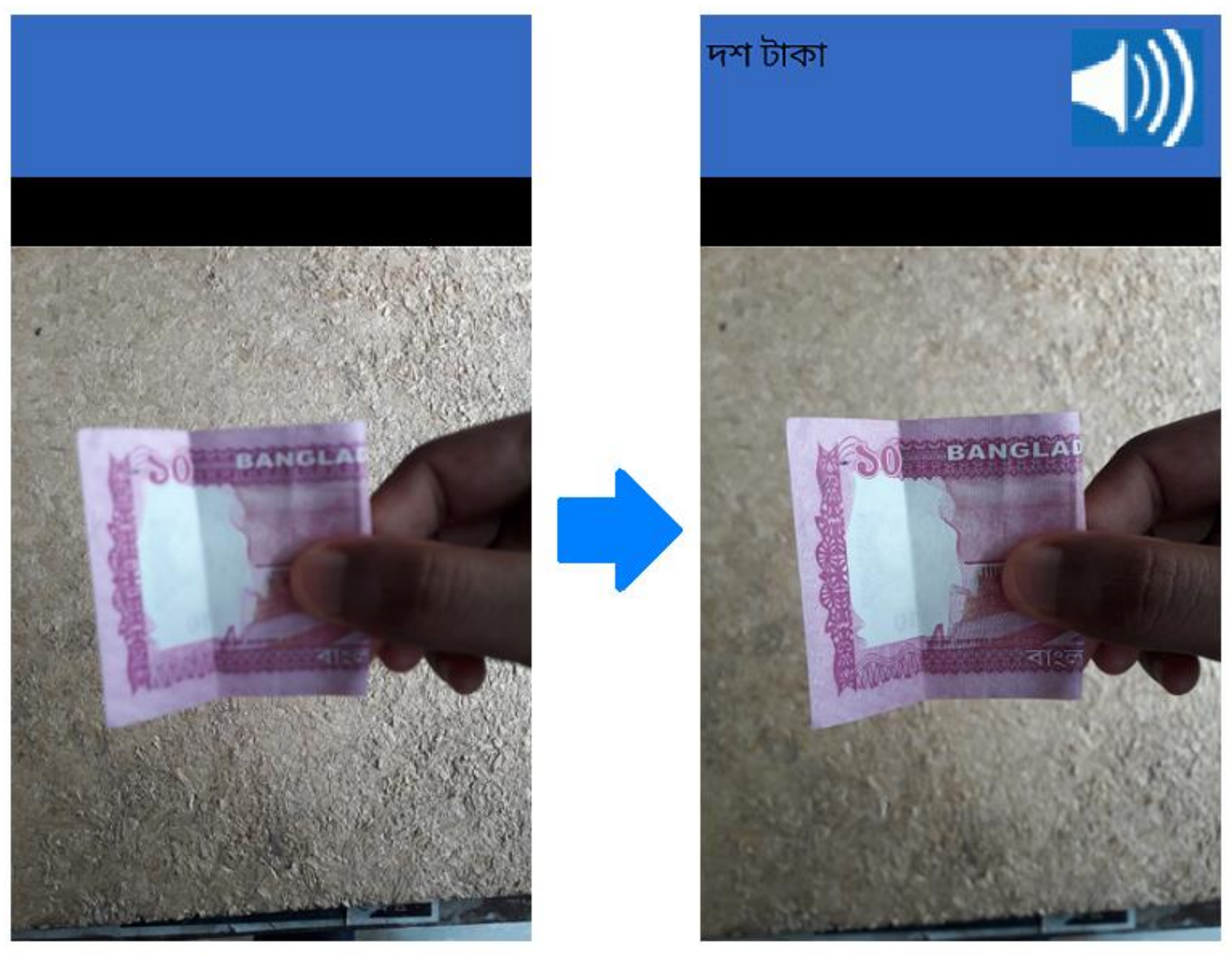
Hasan Murad
1305040.hm@ugrad.cse.buet.ac.bd

Nafis Irtiza Tripto
nafisirtiza@cse.buet.ac.bd

Mohammed Eunus Ali
eunus@cse.buet.ac.bd

1 Objective

To develop Bangla currency recognizer for visually impaired people by using deep leaning based approach

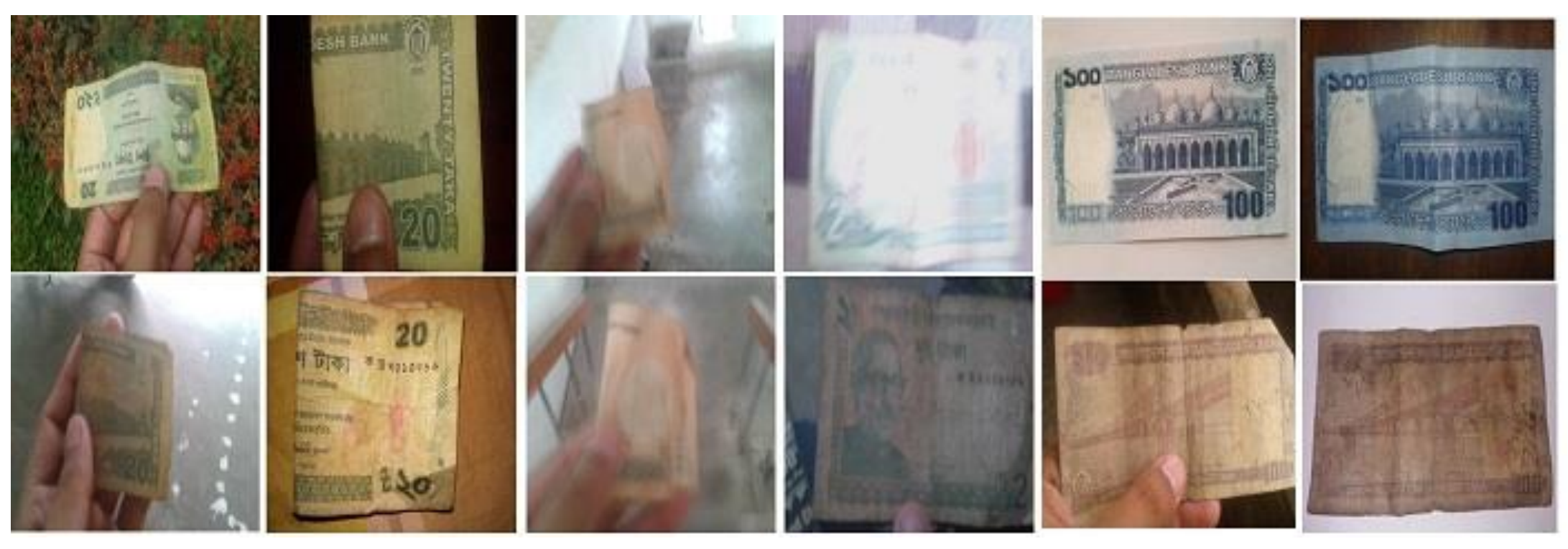


2 Motivation

- ❑ Globally 253 million visually impaired people
- ❑ Almost 800,000 blind people in Bangladesh
- ❑ Ineffective and difficult traditional techniques
- ❑ No promising Bangla currency recognizing application

3 Challenges

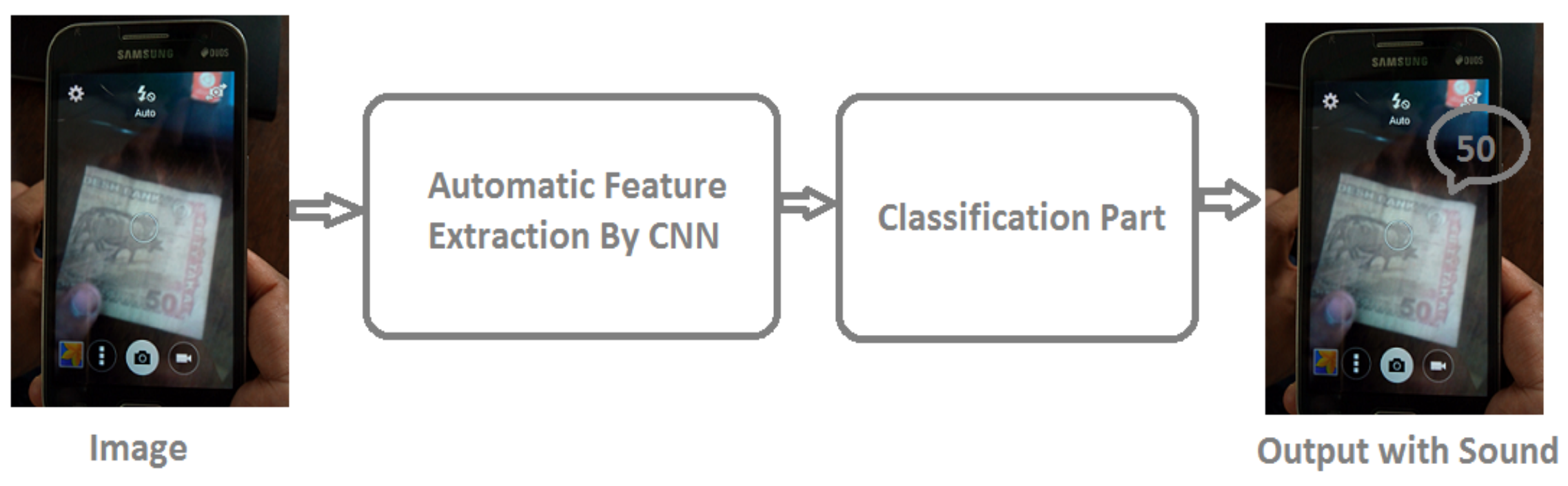
- ❑ Heterogeneous background
- ❑ Different resolution of phone camera
- ❑ Poor condition of paper currency
- ❑ High accuracy and low latency for mobile application development



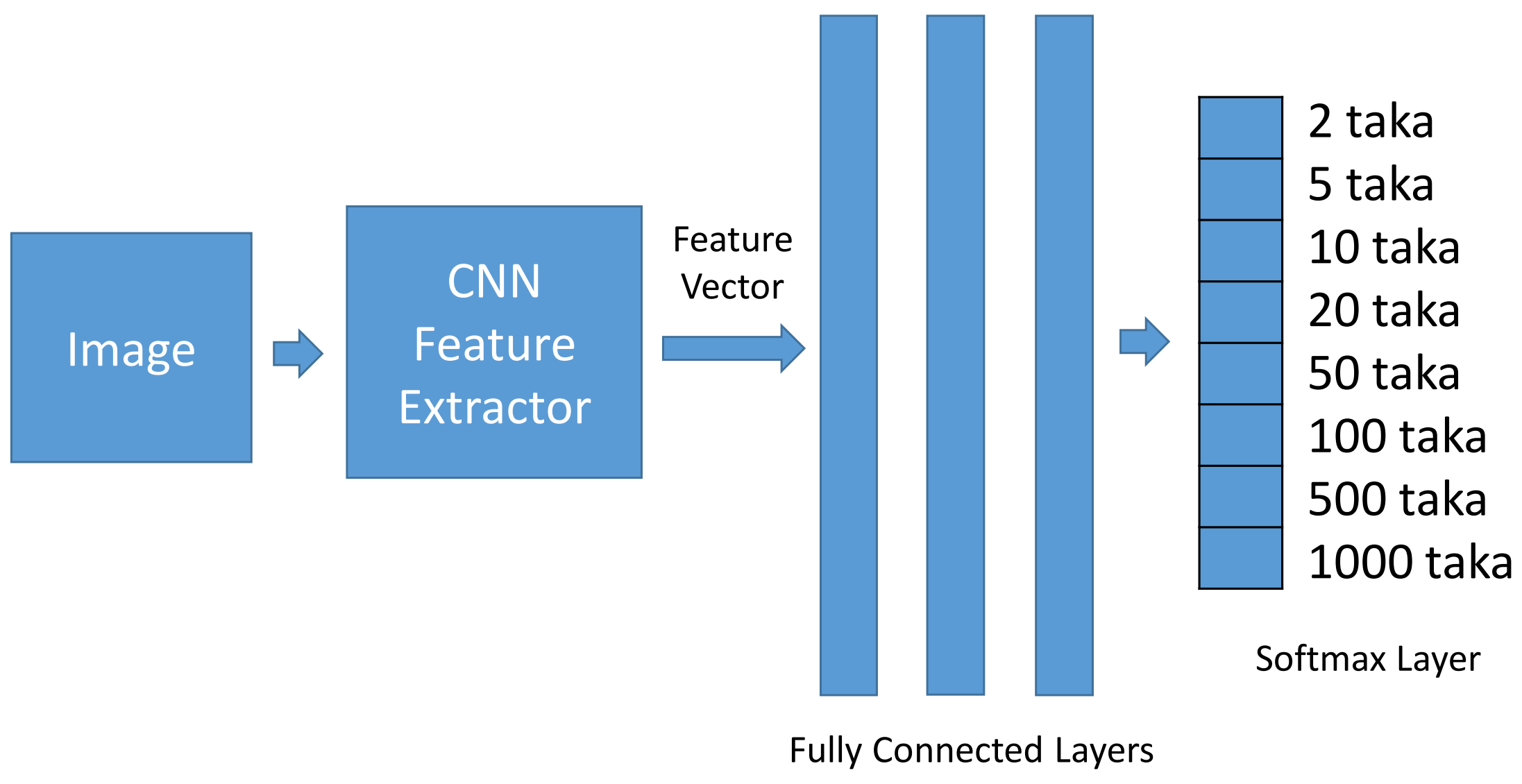
4 Limitations in previous works

- ❑ Inefficient hand-crafted feature extraction methods
- ❑ Poor performance in unconstrained environment
- ❑ Restriction like full scan of note
- ❑ No deep learning based approach

5 Solution Overview



6 Deep Learning Architecture



7 Bangla Currency Dataset

- ❑ A novel dataset with 8000 images
- ❑ Manually collected: 7500 images
- ❑ Online sources: 500 images
- ❑ Diverse lighting conditions and Heterogeneous backgrounds
- ❑ Using different types of phone cameras

8 Training Results

- ❑ Deep learning feature extractor: MobileNet
- ❑ Different resolution of phone camera
- ❑ Training approach: Fine-tuning

Model Name	Training	Validation	Testing
MobileNet_v1_1.0_224	99.91%	99.81%	99.80%
MobileNet_v1_0.75_224	98.20%	97.01%	97.02%
MobileNet_v1_0.50_224	97.90%	94.00%	93.80%
MobileNet_v1_0.25_224	93.10%	90.01%	90.20%

Table: Training Summary

9 Requirement Analysis

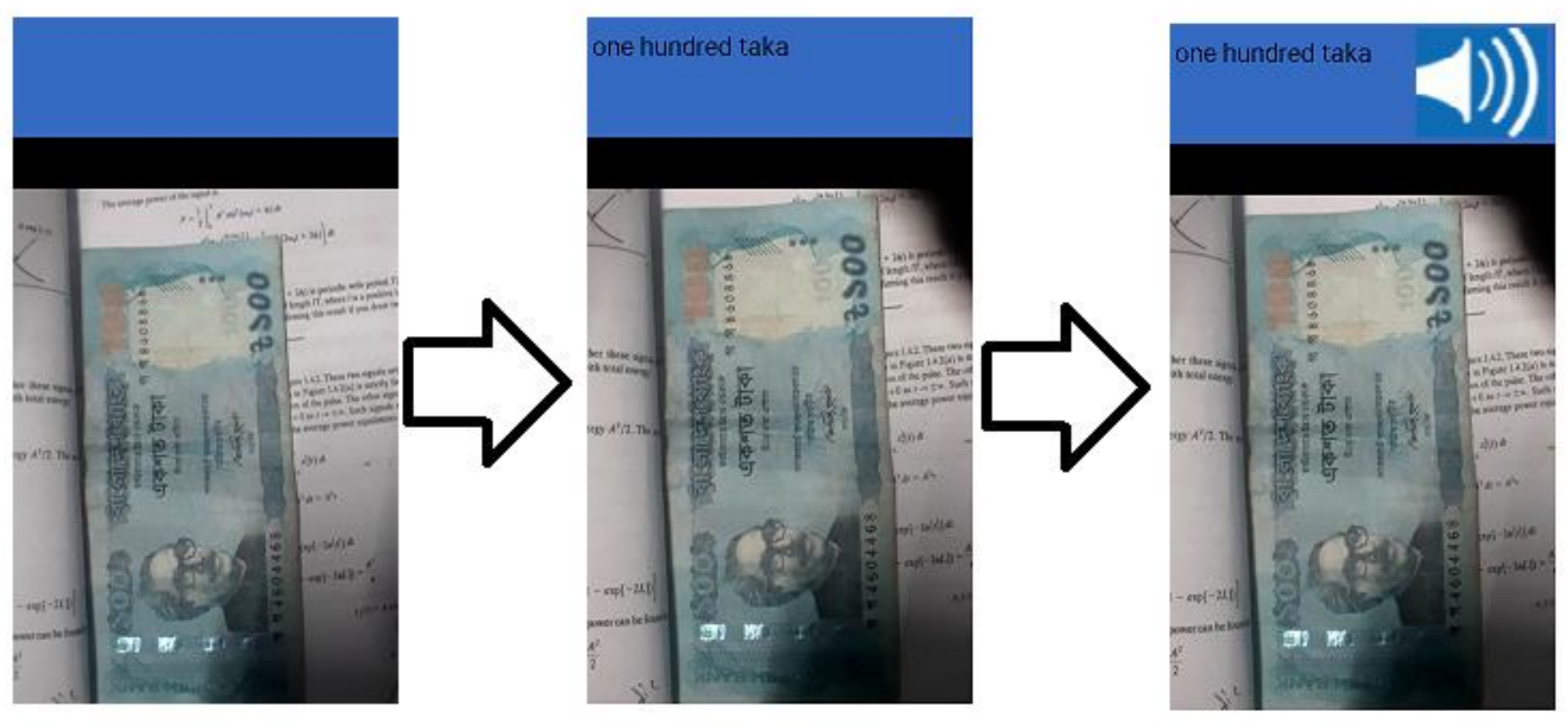
Unique Requirements for visually impaired people:

- ❑ Real time recognition in video mode
- ❑ Compatible with TalkBack or built-in accessibility features
- ❑ Simplicity in setting options
- ❑ Clear and non-robotic sound in both Bangla and English

General requirements:

- ❑ Recognition of currency without any internet requirement
- ❑ Low latency standard application size

10 App Design and Implementation



11 Evaluation with Testers

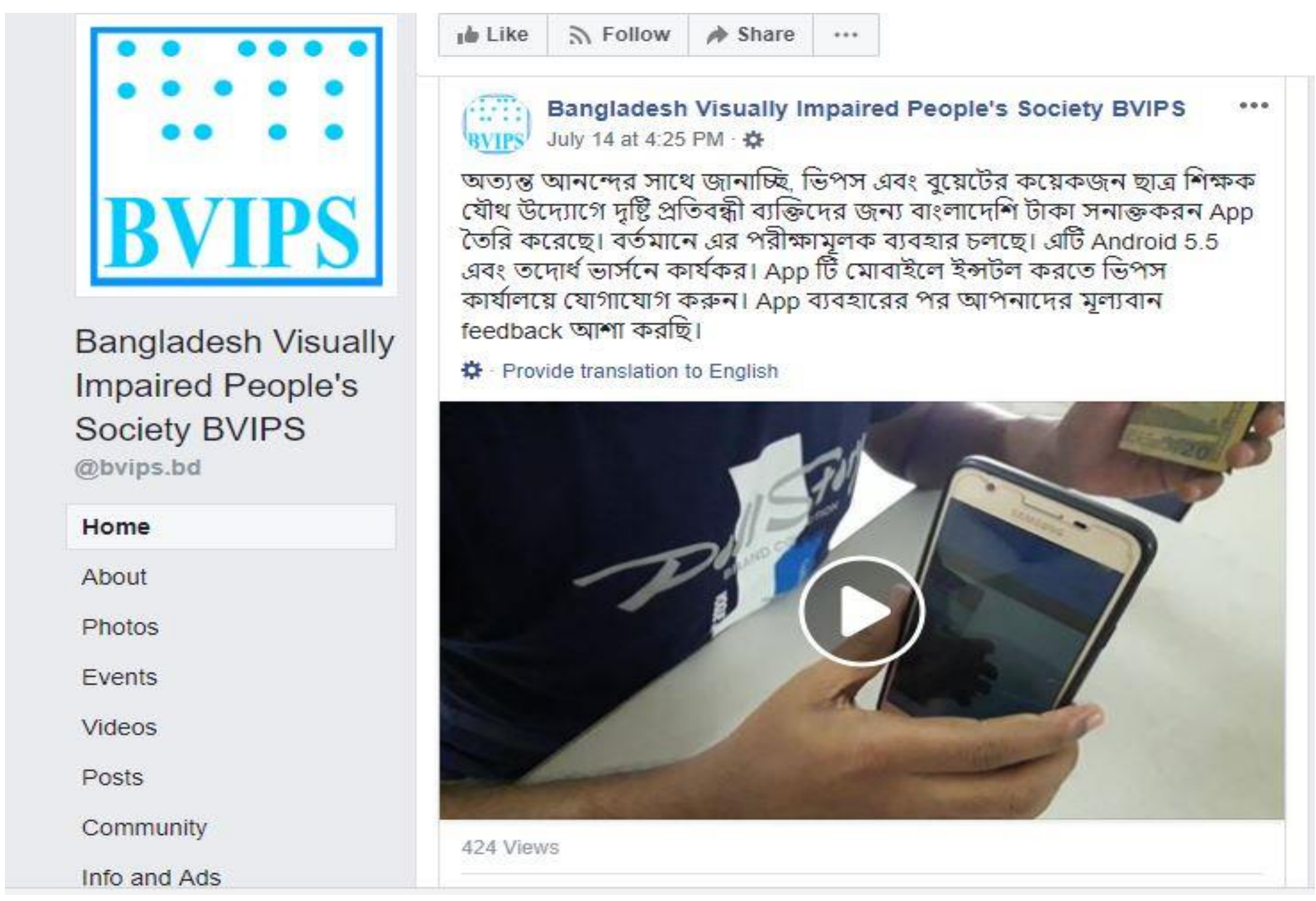
Tester ID	Number of Test	Right	Wrong
1	50	49	1
2	50	47	3
3	50	48	2
4	50	49	1
5	50	49	1
6	50	48	2
7	50	47	3
8	50	50	0
9	50	48	2
10	50	50	0

Table: Testing summary for individual user

12 User Feedback

Real User ID	Usefulness	Simplicity	Accuracy
1	5	4.5	5
2	5	5	4.5
3	5	4.5	5
4	5	5	5
5	5	5	4.5

Table: Feedback summary from participants



Bangladesh Visually Impaired People's Society BVIPS
July 14 at 4:25 PM

অত্যন্ত আনন্দের সাথে জানাচ্ছি, ভিপস এবং বুয়েটের কয়েকজন ছাত্র শিক্ষক যৌথ উদ্যোগে দৃষ্টি প্রতিবন্ধী ব্যক্তিদের জন্য বাংলাদেশি টাকা সনাক্তকরন App তৈরি করেছে। বর্তমানে এর পরীক্ষামূলক ব্যবহার চলছে। এটি Android 5.5 এবং তদোর্ধ ভার্সনে কার্যকর। App টি মোবাইলে ইন্সটল করতে ভিপস কার্যালয়ে যোগাযোগ করুন। App ব্যবহারের পর আপনাদের মূল্যবান feedback আশা করছি।

13 Conclusion

- ❑ Creation of a novel Bangla currency dataset for research community
- ❑ Development, distribution, and evaluation of a Bangla currency recognizer for the visually impaired people in Bangladesh
- ❑ Establishment of an effective communication channel with the blind community

Bangladesh
University of
Engineering and
Technology

DataLab@CSE, BUET
Room 201, Dept. of CSE, BUET
datalabbuet@gmail.com
datalab.buet.io

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